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Study of the bark-dwelling spiders (Araneae) on black pine (Pinus nigra) I.

by
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Abstract: Spiders were collected in two lines of planted trees in a town called Szombathely (Hungary) and in a black pine plantation in the Kőszeg Mountains. The study was carried out in 1995 and 1996. Samples were collected three times with trunk-traps placed on the trunks at two meters height. During our study 1603 specimens belonging to 42 species were trapped. Both the number of species and specimens collected in the town exceeded those in the Kőszeg Mountains. The structure of the spider fauna also differed among the three sampling sites.
Key words: bark-dwelling spiders, black pine, town

Introduction

Some of the tree-dwelling spiders temporarily or seasonally stay under the bark or on its surface. Special microclimatic and structural conditions develope in the cracks of the bark and in the hollows. Furthermore, a certain number of insects live on the bark, which serve as prey for the predators living on or under the bark and thus offer the possibility of constant colonization. This might explain the fact that some of the spiders are adapted to this special habitat so perfectly that bark might be the only adequate habitat for them. Only a small number of authors have been engaged in studying bark-dwelling spiders so far (Koslinska 1967, Albert, 1976, Wunderlich 1982, Hansen 1992, Simon 1995, Bogya 1995, Koponen 1996, Szinetár 1996a). Koslinska (1967) studied bark-dwelling Arachnids in orchards in Poland (He got his samples by pearling the bark). Albert (1976) investigated the bark-dwelling spiders in the beech forest of Solling. According to him 49 species out of the 85 he collected seemed to appear characteristically on the bark and not on the ground level. Wunderlich (1982) carried out a summary on the bark-dwelling fauna of Central Europe on the basis of his own and other researchers' collections. Besides having described the most frequent bark-dwelling species he also tipified them as exclusive and facultative bark-dwellers. Hansen (1992) performed an investigation on the bark-dwelling Arachnids of *Platanus* trees in Venice. There have also been some similar studies in Hungary since 1994. First the study of the bark-dwelling spider fauna of Platan trees was carried out repeating the studies of Hansen (Szinetár 1996a).

Bogya placed trunk-traps on apple and pear trees in order to collect *Clubiona* spiders in orchards of the Netherlands and in Hungary (Bogya 1995). We began to apply this method in the autumn of 1995 to study the bark-dwelling spiders on black pine. Balogh (1935) studied the foliage-dwelling spiders of black pine in the 30's, and Szinetár (1996b) has been studying it since the middle of the 90's.

There were studies on pine with liquid trunk-trap and branch-trap method in Germany (Simon 1995) (samples were taken from the top to ground level). In South-West Finland

near the north forest border Koponen (1996) studied the spider species living on the bark and on the branches of turkey oakes. He made a comparison between his data and other studies carried out on the spider fauna of beech and pine species in other countries of Europe, but he could not prove significant differences in the species structure.

The aim of our study was to observe the black pine adapted spider fauna and their frequency. Studying paralelly a town habitat in Szombathely and a forest habitat in Kőszeg Mountains we would answer the following questions:

1. Which species and which guilds can be found on the trunk of the black pine?
2. Which are the most typical species accompanying black pine?
3. Is there any difference in the quantity and quality of the spider fauna of the black pine:
   a) between the two different habitat in the city in Szombathely?
   b) between biotopes in the town and in the forest?
   c) compared to other studies on different tree species?

Material and methods

Samples were taken with trunk-traps made of waved cardboard. Traps were 15 centimeters wide and placed at 2 meters above the ground on the trunk. Belts were put around the trunk, their waved surfaces facing the trunks and covering the whole outline of the tree as if a kind of artificial bark. We provided each of the sampling sites with 30 trunk-traps in the October of 1995. We checked the traps 3 times during 1996, in January, April, and in June, collecting 10-10 samples on an occasion. The samples were collected at around noon or early in the afternoon in calm weather. Bogya (1995) applied similar methods in orchards in the Netherlands. He is using the same methods in Hungary as well.

We sorted out the samples in the laboratory and the specimens were stored in 70% ethanol.

Some juveniles were kept at 20–22 C° temperature fed with fruit-flies (*Drosophila melanogaster*) until they completely developed and we could identify them. We used the books of Loksa (1969, 1972), Heimer & Nentwig (1991) and that of Roberts (1995) for identification and the nomenclature of Platnick (1997) was followed.

We carried out our studies at the following sampling sites:

1. Szombathely, Gagarin avenue (G; Traps were installed: 22.10.1995.; Collecting time: 16.01.1996., 12.04.1996., 18.06.1996.)

This avenue is surrounded by detached houses. There is only a small road along it therefore the air pollution is not significant here.

2. Szombathely, Paragvári street (P; Traps were installed: 22.10.1995.; Collecting time: 17.01.1996., 12.04.1996., 18.06.1996.)

This site is situated next to a main road, which leads the traffic partly to Kőszeg and partly to Gencsapáti. Because of the heavy traffic the air is heavily polluted in this part of the town.

3. Kőszeg Mountain, Hörmann spring (K; Traps were installed: 23.10.1995.; Collecting time: 18.01.1996.; 13.04.1996.;19.06.1996.)

This site is situated in the southern part of the mountain 720 meters above the sea level. There is a quite large black pine forest stand here, which was planted during the second World War. This area is completely free from air pollution and from other sorts of disturbances.

Results

During our study we found altogether 1603 specimens (Gagarin avenue: 26 species, 10 genus, 966 specimens; Paragvári street: 13 species, 6 genus, 444 specimens; Kőszeg Mountains 14 species, 2 genus, 193 specimens) belonging to 37 species and to another 13

Table 1. Bark-dwelling spider families on black pine (female/male (juvenile)) in Szombathely (G: Gagarin avenue, P: Paragvári street) and in Kőszeg Mountains (K)

Species	G	P	K	Σ
Segestriidae				
Segestria bavarica C.L.Koch,1843	2/2(1)	-/-(-)	-/-(-)	2/2(1)
Segestria senoculata (Linnaeus,1758)	-/-(-)	-/-(-)	7/1(26)	7/1(26)
Dysderidae				
Harpactea hombergi (Scopoli,1763)	-/-(-)	-/-(-)	2/-(15)	2/-(15)
Harpactea rubicunda (C.L.Koch,1838)	4/1(-)	-/-(-)	-/-(-)	4/1(-)
Harpactea sp.	-/-(1)	-/-(-)	-/-(-)	-/-(1)
Theridiidae				
Anelosimus vittatus (C.L.Koch,1836)	-/-(3)	-/-(-)	-/-(-)	-/-(3)
Dipoena melanogaster (C.L.Koch,1837)	-/-(-)	-/-(1)	-/-(-)	-/-(1)
Dipoena sp.	-/-(2)	-/-(-)	-/-(-)	-/-(2)
Steatoda bipunctata (Linnaeus,1758)	23/9(1)	7/2(3)	-/-(-)	30/11(4)
Theridion blackwalli O. P.-Cambridge,1871	3/-(2)	1/-(5)	-/-(-)	4/-(7)
Theridion impressum L.Koch,1881	-/-(-)	-/-(1)	-/-(2)	-/-(3)
Theridion mystaceum L.Koch,1870	-/-(20)	-/-(79)	-/-(1)	-/-(100)
Theridion sp.	-/-(1)	-/-(-)	-/-(-)	-/-(1)
Theridion tinctum (Walckenaer,1802)	-/-(88)	4/-(107)	-/-(-)	4/-(195)
Linyphiidae				
Linyphiidae sp.	-/-(1)	-/-(-)	-/-(-)	-/-(1)
Moebelia penicillata (Westring,1951)	3/1(-)	-/-(-)	-/-(-)	3/1(-)
Linyphiidae sp.	-/-(1)	-/-(-)	-/-(-)	-/-(1)
Tetragnathidae				
Tetragnatha sp.	-/-(-)	-/-(1)	-/-(-)	-/-(1)
Zygiella sp.	-/-(1)	-/-(1)	-/-(-)	-/-(2)
Araneidae				
Araneus diadematus Clerck,1757	-/-(-)	-/-(-)	-/-(1)	-/-(1)
Araneus sp.	-/-(-)	-/-(1)	-/-(-)	-/-(1)
Gibbaranea bituberculata (Walckenaer,1802)	-/-(8)	-/-(2)	-/1(19)	-/1(29)
Nuctenea umbratica (Clerck,1757)	2/-(8)	5/1(6)	-/-(-)	7/1(14)
Agelenidae				
Tegenaria ferruginea (Panzer,1804)	-/-(2)	-/-(-)	-/-(-)	-/-(2)
Dictynidae				
Lathys humilis (Blackwall,1855)	2/-(3)	-/-(3)	-/-(1)	2/-(7)
Nigma walckenaeri (Roewer,1951)	2/-(-)	-/-(-)	-/-(-)	2/-(-)
Amaurobiidae				
Amaurobius fenestralis (Stroem,1768)	-/-(-)	-/-(-)	4/-(8)	4/-(8)
Anyphaenidae				
Anyphaena accentuata (Walckenaer,1802)	-/-(167)	-/-(-)	-/-(-)	-/-(167)
Liocranidae				
Liocranum rupicola (Walckenaer,1830)	1/-(-)	-/-(-)	-/-(-)	1/-(-)
Clubionidae				
Cheiracanthium mildei L.Koch,1864	1/3(34)	-/-(-)	-/-(-)	1/3(34)

Species	G	P	K	Σ
Clubiona brevipes Blackwall,1841	-/-(1)	-/-(-)	-/-(-)	-/-(1)
Clubiona corticalis (Walckenaer,1802)	-/-(-)	-/-(-)	7/4(24)	7/4(24)
Clubiona genevensis L.Koch,1866	1/-(23)	1/-(128)	-/-(-)	2/-(151)
Clubiona pallidula (Clerck,1757)	10/12(362)	-/-(-)	-/-(-)	10/12(362)
Clubiona sp.	-/-(-)	-/-(1)	-/-(-)	-/-(1)
Gnaphosidae				
Micaria subopaca Westring,1862	1/-(-)	-/-(3)	-/-(-)	1/-(3)
Scotophaeus scutulatus (L.Koch,1866)	2/1(37)	-/-(37)	-/-(-)	2/1(74)
Scotophaeus sp.	-/-(1)	-/-(-)	-/-(-)	-/-(1)
Philodromidae				
Philodromus dispar Walckenaer,1826	-/-(1)	-/-(-)	-/-(1)	-/-(2)
Philodromus longipalpis Simon,1870	-/-(-)	-/-(-)	-/-(-)	-/5(-)
Philodromus margaritatus (Clerck,1757)	1/-(4)	-/-(-)	-/-(-)	1/-(4)
Philodromus praedatus O.P-Cambridge,1871	1/-(-)	-/-(-)	-/-(-)	1/-(-)
Philodromus rufus Walckenaer,1826	1/-(1)	-/-(7)	-/-(-)	1/-(8)
Philodromus spp. (aureolus)	-/-(91)	-/-(36)	-/-(53)	-/-(180)
Philodromus spp. (margaritatus)	-/-(8)	-/-(1)	-/-(8)	-/-(17)
Thomisidae				
Diaea dorsata (Fabricius,1777)	-/-(-)	-/-(-)	-/-(1)	-/-(1)
Salticidae				
Euophrys erratica (Walckenaer,1826)	-/-(-)	-/-(-)	4/-(-)	4/-(-)
Macaroeris nidicolens (Walckenaer,1802)	-/-(3)	-/-(-)	-/-(1)	-/-(4)
Marpissa muscosa (Clerck,1757)	-/-(-)	-/-(-)	-/-(2)	-/-(2)
Pseudicius encarpatus (Walckenaer,1802)	-/-(1)	-/-(-)	-/-(-)	-/-(1)
	60/29/(877)	18/3(423)	24/6(163)	102/38(1463)

Table 2. Guild composition of spiders on the bark of black pine in Szombathely (G: Gagarin avenue, P: Paragvári street) and in Kőszeg Mountains (K)
(Crab spiders include *Thomisidae* and *Philodromidae*)

Guilds	G	P	K
WEB BUILDERS			
Space web spiders	18.43%	47.97%	34.71%
Orb weavers	1.97%	3.83%	10.88%
Σ WEB BUILDERS	20.40%	51.80%	45.59%
HUNTERS			
Runners			
Nocturnal hunters	68.01%	38.29%	18.13%
Σ Runners	68.01%	38.29%	18.13%
Ambushers			
Crab spiders	11.18%	9.91%	32.12%
Jumping spiders	0.41%	0.00%	4.16%
Σ Ambushers	11.59%	9.91%	36.28%
Σ HUNTERS	79.60%	48.20%	51.41%
	100.00%	100.00%	100.00%

Table 3. The most frequent bark-dwelling spiders on black pine concerning collecting places and dates (G: Gagarin avenue, P: Paragvári street, K: Hörmann spring, Kőszeg Mountains) (1 = the most frequent species, – = missing from the 10 most frequent species):

	January				April		
	G	P	K		G	P	K
Clubiona pallidula	1	–	–	*Clubiona pallidula*	1	–	–
Anyphaena accentuata	2	–	–	*Clubiona genevensis*	2	1	–
Theridion tinctum	3	1	–	*Theridion mystaceum*	3	2	–
Philodromus spp.(aureolus)	4	2	1	*Theridion tinctum*	–	3	–
Clubiona genevensis	–	3	–	*Clubiona corticalis*	–	–	1
Gibbaranea bituberculata	–	–	2	*Segestria senoculata*	–	–	2
Clubiona corticalis	–	–	3	*Philodromus spp.(aur)*	–	–	3

	June		
	G	P	K
Scotophaeus scutulatus	1	1	–
Theridion blackwalli	2	6	–
Nuctenea umbratica	3	5	–
Micaria subopaca	–	2	–
Theridion tinctum	–	3	–
Segestria senoculata	–	–	1
Harpactea hombergi	–	–	2
Amaurobius fenestralis	–	–	3

taxa determined on the level of genera. 7.87 percent of the trapped spiders that is 115 individuals were mature when they were collected. 89 of them were females (77.39%) and 26 of them were males (22.61%).

We sum up the data of the collected taxa in Table 1. The distribution of data sorted by hunting strategies is shown in Table 2., while in Table 3. we can see the data of the most frequent species sorted by sampling sites and times.

Discussion

Beside frequent bark-dwelling spiders we also found some rare species. In spite of their low numbers some of the rare species seem to be characteristic ones (*Entelecara penicillata, Amaurobius fenestralis, Harpactea hombergi, Micaria subopaca, Marpissa muscosa*). It is also important to point out that we found a species characteristic of the South-European fauna (*Cheiracanthium mildei*).

The following species can be regarded as species accompanying black pine forests: *Philodromus (aureolus)* species-group (*longipalpis, praedatus*), *Macaroeris nidicolens, Clubiona genevensis, Lathys humilis, Theridion mystaceum, Theridion tinctum, Dipoena melanogaster.*

As Table 3 shows there are significant differences between not only the spider fauna of the town and that of the mountains, but also between the two sampling sites of the town.

Many of the collected species were found on the trunks of various trees in Europe, thus indicating that this trunk fauna generally lives on trees, not especially on black pine. Of the collected species Wunderlich (1982) listed *Entelecara penicillata, Amaurobius fenestralis, Micaria subopaca, Philodromus margaritatus, Marpissa muscosa, Harpactea hombergi* as exclusive dwellers on or under bark of living trees in Central Europe; and *Segestria senoculata, Segestria bavarica, Steatoda bipunctata, Nuctenea umbratica, Scotophaeus scutulatus,* and *Clubiona corticalis* as facultative bark-dwellers.

18 of the 42 species found have been reported on the trunk of pine (Simon 1995) and 12 species occur on the trunk of turkey oak (Koponen 1996). These facts prove that the distribution of the majority of bark-dwellers species were not affected by climatic and different structural factors. Of the abundant or other interesting black pine species in Hungary, only the following were not listed in the above-mentioned Wunderlich (1982) lists: *Clubiona pallidula, Anyphaena accentuata, Theridion tinctum, Gibbaranea bituberculata, Lathys humilis, Euophrys erratica, Cheiracanthium mildei, Diaea dorsata, Dipoena melanogaster, Pseudicius encarpatus.* Out of the above mentioned species only *Pseudicius encarpatus* can be regarded as a real bark-dwelling spider as the other nine species appear on the barks only during winter when they use the bark for overwintering. If we compare the three different collecting sites with each other we may state that, there might be significant differences between the sampling sites even in one microregion.

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